



**HOW CAN THE AIR FORCE MAXIMIZE
THE VALUE OF REVERSE AUCTIONING AS
A PRICING TECHNIQUE?**

THESIS

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Abstract

This research examines the pricing tool reverse auctioning. In a reverse auction buyer's state the item they wish to buy and the sellers compete with each other for the sale, driving the price steadily down until no seller is willing to go any lower. Darleen A. Druyun, Principal Deputy Assistant Secretary of the Air Force for Acquisition and Management, Washington, D.C., launched the Air Force acquisition reform "Lightning Bolts" initiatives. These initiatives jump-start acquisition reform to find processes leading towards a better, faster, and cheaper way of conducting business. A reverse auction is one of these processes. A review of the extant literature shows that reverse auctioning has been utilized in the commercial sector since 1994, covering thousands of types of items.

Preliminary research explored the appropriateness of reverse auctioning in Information Technology. Recent studies indicate the use of reverse auctioning should be expanded beyond Information Technology. Air Force acquisition professionals have utilized reverse auctioning as the pricing technique for twenty procurements, nearly all for the procurement of low price Information Technology. This research will assist acquisition professionals in better understanding the challenges related to the use of the reverse auction beyond low price Information Technology.

HOW CAN THE AIR FORCE MAXIMIZE THE VALUE OF REVERSE AUCTIONING AS A PRICING TECHNIQUE?

I. INTRODUCTION

Background

More than twenty Fortune 500 companies have used reverse auctions since 1994. These include Caterpillar, Procter & Gamble, United Technologies and Zenith (Rafter, 98). Additionally, the Department of Defense (DOD) has used reverse auctions since May 2000 (NAVICP, 2000). DOD has completed several successful implementations of the reverse auction process focusing primarily on procuring low cost, Information Technology (IT) items. Reverse auctioning is an acquisition reform initiative that is of great potential value to the acquisition workforce due to the current acquisition environment highlighted by workforce reductions and budget constraints. This thesis describes the potential to expand the use of reverse auctions beyond the procurement of low cost IT products.

The Acquisition Environment

The Federal Acquisition Streamlining Act (FASA) of 1994 and the Clinger-Cohen Act of 1996 are enabling the DOD to find ways to reduce costs and to simplify processes. The FASA focuses on (1) reducing unique purchasing requirements; (2) increasing the use of simplified acquisition procedures; and (3) obtaining goods and services faster while reducing in-house procedures. The Information Technology Management Reform Act (ITMRA) and the Federal Acquisition Reform Act (FARA)

together are known as the Clinger-Cohen Act and further advance the changes made by FASA. The Clinger-Cohen Act provides opportunities for the DOD to further streamline and reduce non-value added steps in the acquisition process. The FARA mandates compliance with 41 U.S.C. 404, which states that government-wide procurement policies, regulations, and procedures should promote economy, efficiency, and effectiveness in procurements made by the executive branch of the federal government (41 U.S.C. 404). This mandate has led the DOD to use this reverse auction pricing technique, although in a very limited manner.

Purpose and Objective of Research

This research identifies and examines the factors for establishing and implementing the reverse auctioning pricing technique. The objective is to determine whether this pricing technique's use may be broadened and to provide guidance for its expansion. Additionally, guidance will be developed to assist procurement professionals in determining if a reverse auction is appropriate for a given procurement action.

Methodology

To accomplish the objectives stated above, this research uses a qualitative, comparative analysis case study. The case studies consist of an examination of contractual documents and interviews with the personnel that conducted four reverse auctions. The data was analyzed to find themes and patterns that occurred during the reverse auctions. The theoretical content of the research was established through literature review, examining the possible expanded use of this tool. A comparative analysis was conducted to examine the strength of the explanation provided by the findings and to determine the validity of the research.

Summary

The Air Force and commercial companies have implemented reverse auctioning as a pricing tool for many types of acquisitions. Due to the mandate to promote efficiency and effectiveness in procurements, this research examines reverse auctioning to determine if further use of the technique is feasible.

II. LITERATURE REVIEW

Definition of Reverse Auction

Harris defines reverse auctions as a twist on the more familiar “forward” auction, in which interested buyers bid against one another for an item until the one willing to pay the highest price is left standing (Harris, 01). In a reverse auction, a single buyer solicits bids from multiple suppliers of a product. Those suppliers then bid the price down until the one willing to sale at the lowest price remains (Harris, 01). Merson defines a reverse auction as the opposite of a traditional auction (Merson, 00). In a traditional auction, a seller offers an item or items for sale while potential buyers compete with each other for the purchase, driving the price steadily up until no buyer will bid any higher. In a reverse auction, multiple sellers of products vie for the business of a single buyer, thereby driving the price down. Bidding continues until a pre-established bidding period ends or until no seller will bid any lower (Merson, 00).

A news release from Randolph Air Force Base, the Air Force Personnel Center, describes reverse auctioning, also known as online auctioning, as different from the standard Air Force procurement practice. Reverse auctioning allows the bidders to see their competitors’ bids, while concealing the company’s identity. Reverse auctioning allows bidders to actively compete through submission of multiple price proposals.

History of Commercial Use

Commercial businesses have used reverse auctions since 1994 (Rafter, 98). With the increased use of the Internet, information technology enables companies to host internet-based reverse auctions. This use of information technology allows businesses to

save time and money in conducting reverse auctions. Reverse auction service providers put billions of dollars in products and services on the auction block creating huge savings for commercial companies (Jap, 00). In 1998, reverse auction provider Freemarkets Online accumulated more than 20 Fortune 500 companies as customers with more than 1,000 suppliers taking part in the reverse auctions. These reverse auctions allowed customers to save an average of 17 percent (Rafter, 98).

Commercial Application

EDS Canada (one of the largest professional IT firms in Canada) used a reverse auction for a large contract labor buy. They had 20 different technical contract labor suppliers and wanted to reduce this to a single primary supplier and one backup quickly. Their solution consisted of issuing a Request For Proposal (RFP) on 2 Feb 00 followed by an electronic reverse auction (Atkinson, 00).

The RFP contained a request for information on 30 different job descriptions for three different regions of the country, and a breakdown for two different classifications, including an hourly rate and a markup rate. The company initially focused on qualitative information rather than price. They made this clear to potential vendors by stating that only qualitative parameters would be considered to make the potential reverse auction players list, the “short list” (Atkinson, 00).

EDS Canada sent out 35 RFPs and received 22 responses. The company short-listed this to six within one week after receiving the supplier responses. Ranking and weighing qualitative parameters such as value-added services stated in the RFP accomplished this. The six finalists received training on the auctioning process and were

reminded their bids were considered along with the qualitative information (Atkinson, 00).

Next, a practice run reverse auction allowed suppliers the opportunity to see if their technology worked and let them become comfortable with the reverse auction process. During the practice reverse auction, the Local Area Network (LAN) crashed. This did not result in a catastrophic failure of the process since safeguards were put in place (Atkinson, 00).

These safeguards included:

- a. A back-up LAN and internet service;
- b. Cellular phones, in case the phone line becomes unavailable;
- c. A backup computer, allowing the provider to act on behalf of the supplier;

A directed message system was developed:

- a. In case of an inappropriate bid a directed message can be sent to the supplier.
- b. To ensure suppliers were not experiencing technical complications.

The reverse auction was set for two hours, with four 15-minute extensions. The reverse auction received 996 bids from the six suppliers during the three-hour period. EDS Canada then short-listed to two suppliers based on the reverse auction bid, in-person presentations conducted the week following the reverse auction, and qualitative factors. They selected a primary supplier and a substitute, awarding both with two-year contracts. The process took approximately two months versus a historical six-month process for a similar procurement (Atkinson, 00).

Commercial enterprise does not limit the use of reverse auctioning to a specific type of acquisition. Many commercial companies today use online reverse auctions to procure everything from raw materials and transportation services to engineered parts, springs, molded plastics, and stampings (Jap 00). Market research from major corporations indicates reverse auctioning has a long-term place in their e-Business strategy. Hence, many corporations are negotiating substantial long-term contracts with reverse auction service providers (Snyder, 00).

Government Applications

“Lightning Bolts” tasked the Air Force’s acquisition personnel to find processes that lead towards a better, faster, and cheaper way of conducting business. Building a 21st century military capable of meeting the 21st century mission, requires an acquisition system that provides the United States Air Force with the highest quality goods in the most affordable and efficient manner possible. This reengineered acquisition system focuses on managing suppliers, rather than supplies (Dickey, 01).

Prior to 1997, the Federal Acquisition Regulations (FAR) prohibited the use of reverse auctioning by government personnel. Upon review, the Office of Federal Procurement Policy (OFPP) determined this prohibition was not in the government’s best interest. The OFPP officials lifted the ban in the FAR and gave government procurement officials a chance to achieve the private sector’s success. In 1997, the FAR rewrite allowed government agencies to consider reverse auctions (Harris, 2001).

The military services rapidly adopted reverse auctioning in 2000. In February 2001, SAF/AQC, signed a memorandum stating the concept of reverse auctions emerged as a potentially viable contract pricing tool. The memorandum encourages acquisition

personnel to use reverse auctions in situations where it is appropriate. This approach allows the Air Force to gain insight into the appropriateness of reverse auctions for certain commodities and services (Scott, 2001).

In 1999, Pennsylvania became the first state to test the on-line reverse auction process by implementing a pilot program with FreeMarkets, a reverse auction service provider. The pilot program included three reverse auctions to procure coiled aluminum, anthracite coal, and road salt. Pennsylvania's Department of General Services estimates saving taxpayers \$3.7 million through the use of the reverse auction pilot program. The pilot program was expanded to include commodity purchases in which savings of \$11 million are estimated (Ritchie, 1999).

In 2000, the United States Postal Service was the first federal agency to undertake the reverse auction process (Matthews, 00). They first bought envelopes and then leased 5,000 trucks through reverse auctions. This reduced their truck leasing costs by 12.5 percent while upgrading the quality of their truck fleet in the process (Harris, 01).

The Naval Supply Systems Command (NAVSUP) conducted their first reverse auction on 5 May 2000 to procure recovery sequencers that are described as the brains of the Advanced Concept Ejection Seat for the B-1 bomber and F-15, F-16, and F-117 fighter aircraft. Offers were received from three potential suppliers and the Navy estimates achieved reductions of 28.9 percent (nearly \$1 million) (Hicks, 00). The NAVSUP continues using reverse auctions and finds a main benefit is they can make a contract award within an hour of the reverse auction. This compares with several weeks in the standard procurement process (Seffers, 00). Table 1 summarizes five reverse auctions conducted by NAVSUP with reported savings of \$14.8M.

NAVSUP: Completed Reverse Auctions			
Item	Evaluation Criteria	Date	Reported Savings
Recovery Sequencers	Price Only	5-May-00	\$932K or 28%
Shipboard Berthing	Technical Acceptable/Low Price	30-Jun-00	\$2.8M or 22%
T-56 Engine Blades	Price Only	3-Aug-00	\$1.2M or 17%
Mobile MRI Services	Best Value	18-Aug-00	Award to other than the low, no savings.
CVN Camels	Best Value	7-Sep-00	\$9.9M or 27%

Table 1 Source: NAVSUP handout, FAI/DAU Reverse Auction Lunchtime Seminar, October 3, 2000

The Air Force conducted their first three reverse auctions on 3 Aug 00 to purchase computer equipment. The three auctions resulted in estimated savings of 27% or \$88K. Continuing success with the procurement of Information Technology (IT) was found as one auction provided savings of \$60,200 or 23% below the General Services Administration (GSA) schedule price and included an option to increase the order quantity by 15% after the auction. These IT reverse auctions lasted approximately 35 minutes each with awards placed with the lowest bidder (Seffers, 00).

The III Corps and Fort Hood Contracting Command conducted the Army Forces Command's first reverse auction. They estimate a 10.67% price reduction under the estimated product price and a significant increase in quality. The requirement was for forty Pentium III computers with peripheral computer equipment. All requirements were met or exceeded with four GSA small business vendors participating in the process. The four vendors were selected through market research on existing GSA schedule holders

who supply computer equipment. Fort Hood spent approximately six days preparing for the auction and the delivery order was signed the same day the auction was completed. Fort Hood is satisfied with the auction process and has plans for expanding its use (Calderon, 01).

The Air Force has taken the first steps toward securing reverse auction enabling services. The Air Force partnered with the Army's Communications-Electronics Command and entered into a licensing agreement with Frictionless, a reverse auction service provider, through the end of December 2001. This agreement allowed Air Force offices to use Frictionless software for conducting reverse auctions (AF Acquisition Newsletter, 2001). As of 1 January 2002 each Air Force office must obtain funding and select the reverse auction service provider of their choice.

Long-term Considerations

Cost reductions are noted in many reverse auctions but there is a need to look at the long-term effect. Some suppliers are able to sustain a sharp price reduction for only a short period of time. Initially, buyers experience reduced prices when they run a reverse auction. These savings reduce the supplier companies' profits. Over the long term, suppliers may not be able to compete at the lower price levels and may eventually be forced to consolidate or leave the industry. In the end, buyers may lose the advantage of the reverse auction and the bargaining power will shift to suppliers (Jap, 00).

Buyers can obtain costs reductions but still must consider the defense industrial base before conducting a reverse auction. The United States' industrial supplier base is shifting. As the Department Of Defense reduces spending, the defense industrial base

shrinks (Washington, 99). Reverse auctioning may further reduce the defense industrial base.

Researching the Market

Prior to implementing a reverse auction, market analysis must be accomplished to gather, organize, and analyze data and practices in the particular market segment.

Advance preparation is important and must focus more upon the market than the product or service. The characteristics of a market in which the reverse auction may be successful follows:

- At least two competent, competitive suppliers.
- A clearly defined requirement each competitor finds attractive.
- Management support for changing suppliers.

Market Research must evaluate if the market warrants a reverse auction and then determine if suppliers would be willing to participate. All acquisition strategies are based on the type of capability being procured, and the type of purchasing relationship depends on the category of this capability. Kraljic provides four separate categories to classify items:

- Criticals
- Commodities
- Generics
- Distinctive

Criticals are the items central to the firm's distinctive technical capability and are crucial to the buyer's profit margin. The loss, absence, or delay of receipt of these items may force the organization out of business. A critical item is not readily available in the

marketplace. It often has limited sources, subject to the complexities and uncertainties of the environment. This is the most sophisticated partnering relationship, focused on customer value. Due to the need for a sophisticated partnering relationship and the availability of limited sources, these high values, high-risk items may not be a viable candidate for a reverse auction.

Commodities are the products or services, which are part of the high value items that the firm needs to stay in business. They are similar to critical items but are readily available in the marketplace. A low risk must be weighed against the high value to the business. Reverse auctions may be viable for low risk, high value commodities.

Generics are the items that the firm needs to do business. They are readily available in the marketplace and have little or no distinctive qualities. There is little risk associated with the procurement of these items and not much value to be gained by distinguishing one from another. Firms try and minimize the time spent acquiring these products through elimination, outsourcing, or long-term re-supply contracts. These low values, low risk items are readily available in the marketplace and may be candidates for a reverse auction.

Distinctives are products that are over specified. They offer no real value to the firm but create risk due to their high costs and their unavailability in the marketplace. They are a bottleneck in the supply chain. Firms should look at distinctive items to see if they can be eliminated and replaced with an item readily available in the marketplace. By plotting requirements against concepts of value and risk, an organization can effectively make a strategic purchasing decision. Figure 1 illustrates the classification of items described above (Kraljic, 83).

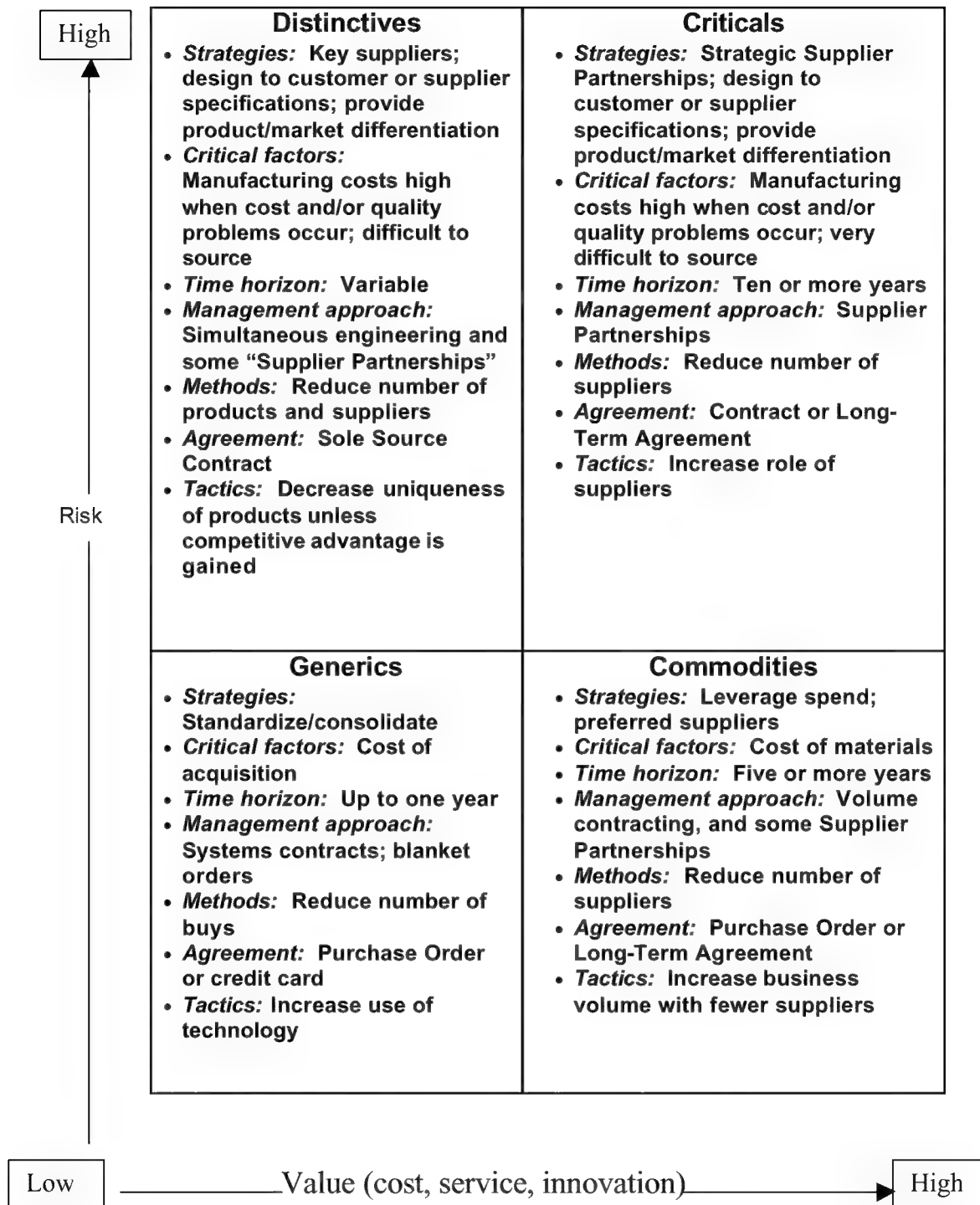


Figure 1: Typology of Capabilities Acquired (Kraljic, 1983)

Supplier-Buyer Relationships

A study was conducted on the results of six auctions conducted in which goods worth a half-billion dollars changed hands (Jap, 00). The study showed the reverse auction process tended to undermine the buyer-supplier relationship. Sellers felt exploited by the process and were less trusting of the buyer. Suppliers stated the reverse auctions took away a mutually beneficial supplier-buyer relationship. Suppliers worked hard to achieve and maintain a good relationship with the buyers and felt it was not fair to compete for a bid in the reverse auction environment. Reverse auctions may damage business relationships, ultimately eroding the economic performance of both buyer and supplier (Jap, 00).

Before implementing strategic purchasing procedures, the organization needs to understand the various supplier relationships. Categories of the buyer-seller relationship follow (Cavinato, 92):

1. Don't know supplier exists and don't care.
2. Don't know supplier exists but might use them if they did know.
3. Arm's length, price-oriented relationship: low value, low risk of obtaining in the marketplace, traditional (i.e. taxicab ride).
4. Price relationship; cooperative from time to time (i.e., returning pallets to the supplier to reduce the price of the next shipment).
5. Price relationship; collaborative over time (i.e., sharing demand forecasts with suppliers so they can level their manufacturing; helps reduce costs).
6. Total cost relationship; cooperating on total supply chain to reduce total cost (i.e., providing performance rather than product specifications to supplier so they can reduce manufacturing costs).
7. Value relationship; linking supplier to customers to emphasize product/service value.
8. Joint ventures; complementary relationships uniting strong/weak attributes of companies.
9. Vertical integration strategies:
 - a) purchasing capital assets for suppliers;
 - b) buying supplier and treating as a subsidiary;
 - c) complete vertical integration of the capability.

The first three relationships identified are based on an arm's length, lowest price

relationship. These items are currently considered good candidates for reverse auctions. Item numbers 4, 5, and 6 are expected to see cost reduction relationships associated with these items. Reverse auctioning may be a good candidate for the procurement of these items in the future. Items 7, 8, and 9 are not considered viable candidates for a reverse auction due to a more sophisticated buyer-seller relationship.

Reverse Auction Service Providers (Merson, 2000)

A service provider (enabler) is the company providing the reverse auction service. Many different companies offer reverse auction services. It is important to select an enabler that best fills the agency's needs since the enablers provide a wide range of services, from making available software for implementing a reverse auction to providing full service. Full service providers have the capacity to fulfill the following:

- Provide market security, global connectivity, and network management;
- Conduct the auction with proven technology in real time without delays;
- Accommodate multiple bidding formats;
- Extend the auction when active bidding makes it appropriate;
- Provide recovery procedures in the event of technical difficulties;
- Provide relevant special terms and conditions;
- Provide expert advice on bundling strategies, bid formats, and other requirements to promote competition; and
- Provide proactive support before, during, and after the bidding process.

Most agencies do not have the technical expertise to conduct their own reverse auction and rely on a full service enabler. Other criteria that organizations should consider prior to selecting an enabler are as follows:

- The track record of the enabler;
- Enabler's knowledge of the market;
- The technology used and its flexibility;
- Contingency plan for technical or other difficulties;
- Training plan for indoctrinating buyers and sellers;
- The ability to use other factors besides price in the process;
- The ability to work within FAR requirements;
- The type of business arrangements required; and
- The method and cost of the enabler's service.

In the Future

Since September 11th, 2001, it is even more critical that procurement offices find savings and efficiencies that can provide every possible penny to apply to homeland defense and the first war of the twenty-first century. It is estimated that an across the board savings of 10 percent can be achieved buying computers, coal, copying, and janitorial services using the reverse auction process. This procurement tool could save over \$3 billion on the state and local levels, and as much as \$6 billion at the federal level (Wyld, 02).

III. METHODOLOGY

Research Strategies

There are five research strategies in the social sciences (Yin, 1994:4). Table 2 provides an overview of the appropriate research methodology associated with each of these strategies.

Strategy	Form of Research Question	Requires Control Over Behavioral Events?	Focuses on Contemporary Events
Experiment	How, why	Yes	No
Survey	Who, what, where, how many, how much	No	Yes
Archival Analysis	Who, what, where, how many, how much	No	Yes/No
History	How, why	No	No
Case Study	How, why	No	Yes

Table 2. Relevant Situations for Different Research Strategies (Yin 1994:6)

The methodology used in this research is the case study. The research question is “How can the Air Force maximize the value of reverse auctioning as a pricing technique?” This question focuses on contemporary events and does not require control over behavioral events.

Case Study Definition

A case study allows for an investigation to retain the holistic and meaningful characteristics of real-life events (Yin, 1994:3). Case study uses direct observation and systematic interviewing to include a full variety of evidence such as documents, interviews, and observation (8). The central tendency of a case study is to illuminate a set of decisions: i.e. why a decision was taken, how it was implemented, and what were

the results (12). Case studies can be based on quantitative data, qualitative evidence, or a combination of the two (14). A case study investigates a contemporary phenomenon within real-life context; even if the boundaries between phenomenon and context are not clearly defined (1).

Yin identifies five applications of the case study. The most important application is to help *explain* the causal links in real-life interventions that are too complex for a survey. A second application is to *describe* an intervention and the real-life context in which it occurred. The third application is to *illustrate* certain topics within an evaluation. The fourth application is to *explore* those situations in which the intervention being evaluated has no clear, single set of outcomes. The final application is *meta-evaluation*, which is a study of an evaluation study. The constant theme in all applications is the program sponsor plays a prominent role in defining the evaluation questions and relevant data categories (Yin, 1994:15).

Case Study Research Design

There are four types of designs for case studies: single-case holistic designs, single-case embedded designs, multiple-case holistic designs, and multiple-case embedded designs (See Table 3).

	Single-Case Designs	Multiple-Case Designs
Holistic (single unit of analysis)	TYPE 1	TYPE 3
Embedded (Multiple units of analysis)	TYPE 2	TYPE 4

Table 3. Basic Types of Designs for Case Studies (Yin, 1994:39)

The design chosen for this research is multiple-case and embedded. A multiple-case study allows for the comparison of more than one case in predicting and/or producing results (Yin, 1994:45). The multiple-case study allows us to look at cases that will predict similar results or produce contrasting results for predictable reasons (46-47). An advantage of the multiple-case study is the evidence is often considered more compelling and regarded as being more robust than in the single case effort (45). This research uses the embedded approach in conducting analysis. The embedded design involves more than one unit or sub-unit of analysis (51).

The following model serves as the basis for conducting this research analysis (Figure 2). In brief, all cases are developed separately which allows for a cross-case comparison and a final report of cross-case conclusions.

Quality of the Research Design

Validity and reliability measure the quality of a research design. Validity is the appropriateness, meaningfulness, and usefulness of the inferences made from the measures. Reliability is the degree to which the observed data is free from errors of measurement (Dooley, 2001:76).

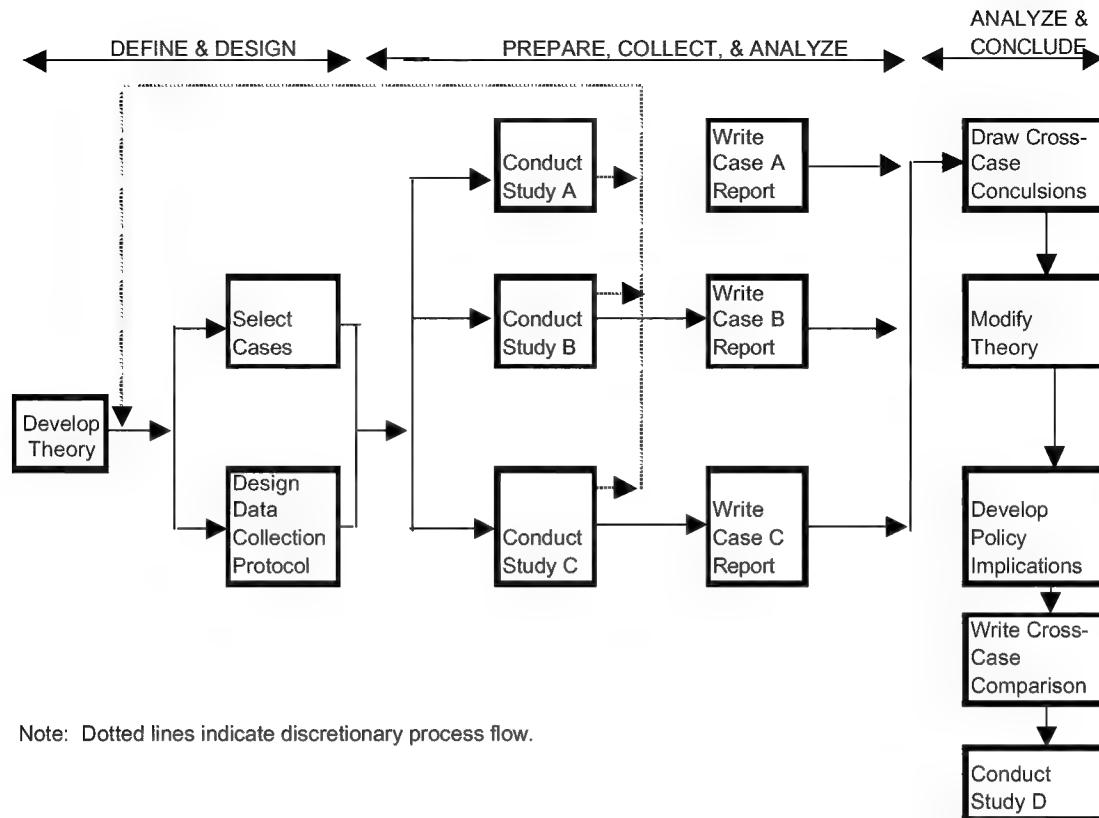


Figure 2: Basic Design Types (Yin, 1994:49)

These two factors are further broken down by Yin in three “tests” to ensure standards of quality are met. These tests measure internal validity, external validity, and reliability (Yin 1994:33). Internal validity occurs in the data analysis phase and is accomplished by using pattern matching. External validity is to determine if the research study’s findings are generalizable beyond the immediate case study (35). To strengthen external validity of this research, three cases were studied and cross-case conclusions formulated, then a fourth case was compared to the findings of the cross-case analysis.

The selection of reverse auctioning cases was by purposive sampling. In purposive sampling, the researcher chooses which cases to include as opposed to random sampling (Dooley, 1995:129). The entire population of Air Force reverse auctions is twenty. There were only four reverse auctions conducted to procure other than

Information Technology (IT). This research seeks to expand the use of reverse auctioning past the procurement of IT; therefore, all four were selected to study in this research effort. However, the first three cases were compared to each other and the fourth case compared in contrast with conclusions of the first three.

Documents and research questions are the two methods of data collection used in this study. The documentation is unobtrusive, exact, and has a long span of time (Yin 1994: 80). Research questions were used to focus directly on reverse auctioning and to provide perceived causal inferences.

A review was made of the applicable contract file information to obtain market research findings, potential or actual protests received, contract type, special contract clauses, and any other significant findings dealing with reverse auctioning. Follow-up calls may be needed to clarify information received during the data analysis period. To ensure accuracy of the researcher, after the case is written-up it will be sent to the respondent for review (Yin 1994: 92).

Investigative Questions

Three investigative areas were focused on in order to answer the research question, “How can the Air Force maximize the value of reverse auctioning as a pricing technique?” Each investigative question is restated with the question intent identified followed by a list of all questions asked in that area.

Investigative Area 1

What is the nature of the Department Of Defense (DOD) competitive market when using reverse auctioning? The intent of this question is to identify the

characteristics of a competitive market and determine what type of buyer-supplier relationship exists.

1. How is the nature of the DOD competitive market affected by reverse auctioning?
2. How does reverse auctioning affect the type of supplier relationship that is involved with the item being procured and what type of relationship is needed?
3. How does reverse auctioning affect the DOD industrial base?
4. How did you determine if your reverse auction was to be restricted and did you have any problems?

Investigative Area 2

Can the Air Force use reverse auctions for other than low price, information technology? The intent of this question is to determine what factors, other than low price, can be considered for award criteria of a reverse auction.

5. What are the award criteria and why was it selected?

Investigative Area 3

What are the primary limitations of the reverse auction process? The intent of this question is to identify factors that limit the usefulness of a reverse auction.

6. Did you develop any special contract clauses for your reverse auction, and, if so, what were they?
7. How was the selection of the reverse auction service provider made?
8. What were the primary limitations of the reverse auction process?

Case Study Tactics

Three tactics were used to collect the case study evidence. First, the use of multiple sources of evidence: documentation and interviews. Documentation was used to corroborate and augment evidence from other sources (Yin, 1994:81). Interviews were

conducted on an open-ended basis, to allow respondents to present facts and opinions about the case study (84). Second, a chain of evidence was established to increase the reliability of the information. This allows an external observer to trace the steps taken in these case studies and obtain the same results. Third, a key informant reviewed the draft case study report. In this research, the reviewers were the actual participants and informants of the case studies. Data was collected from multiple sources of evidence to facilitate convergent lines of inquiry; this insures the most accurate data for the research findings (92).

Reliability assures if a later investigator follows the same procedures, the same findings will be concluded. “The goal of reliability is to minimize errors and biases in the study”. Case study protocol and the development of a case study database are used to assure quality documentation during data analysis (Yin 1994, 63).

Case study protocol is essential when using a multiple-case design. Protocol is intended to guide the researcher in carrying out the case study and is the major tactic in increasing the reliability of case study research. Protocol includes an overview of the case study project, field procedures, case study questions, and a guide for the case study report. Documenting and organizing all of the research information in a study database increases the reliability of the research (Yin 1994, 94). Protocol was used to establish the rules that were adhered to during this research. To assure each case study participant was informed of the same information, the researcher used an e-mail that was sent to all participants for initial contact (Appendix A). A standard set of open-ended basic questions was developed that linked directly to the study’s research question (Appendix

B). Each case study participant answered the same research questions to allow for a comparative analysis.

Data Analysis

Three methods were used for data analysis: mind mapping, pattern matching, and a comparative analysis. Each is discussed separately.

This research uses mind mapping and is effective for organizing information. The objective of mind mapping is to create a picture of each reverse auction (Buzan, 93). A comparative analysis between the reverse auctioning case studies identifies factors that allow for implementation of the reverse auction. This comparative analysis examines the strength of each explanation provided.

Internal validity is achieved by establishing a causal relationship, whereby certain conditions lead to other conditions (Yin, 1994:33). Matching patterns helps establish the inferences from the data collected are correct. Between case pattern matching strengthens the internal validity (109-111). In this case, the analytical tactic of pattern matching will be used to compare an empirically based pattern with a predicted one. If the patterns coincide, the internal validity of this case study is strengthened (106).

IV. DATA ANALYSIS AND RESULTS

Introduction

The purpose of this chapter is to present the information gathered and display the detailed analysis performed on the three case studies. The cross-case findings will then be compared to a fourth case to see if the cross-case findings are supported. The objective is to determine whether the reverse auction technique should be broadened and to provide guidance. This chapter is divided into three main sections. First, an overview of each case study is presented as it correlates to the investigative questions together with the development of a mind map. Second, a comparison of the case studies is conducted using comparative analysis and pattern matching. This helps to identify the factors that allow implementation of reverse auctioning and evaluate such factors as why a decision was taken, how it was implemented, and what was its result. Finally, a fourth case is studied to determine if the findings of the first three cases are supportable.

Case A – Overview

This reverse auction was conducted to procure 35 collar assemblies for the F-16 aircraft. The total estimated cost based on historical buys was \$145,425.00. The award was made to the pre-qualified bidder with the lowest bid of \$121,500, a savings of 17%.

Case A – Mind Map

A mind map for the research question responses and acquisition documentation is shown in Appendix C. The mind map creates a picture that explores all the possibilities of this reverse auction. This picture provides a good overview and enables us to visualize

connections. The mind map has the three research investigative central ideas with each idea becoming the nucleus for a new group of ideas.

Investigative Question 1

The first central idea explored is the nature of the Department Of Defense (DOD) competitive market.

- A commercial item is any item, other than real property, that is customarily used by the general public or other entities for other than governmental purposes (FAR). Market research was conducted prior to selecting the reverse auction technique and indicated this item is a commercial item available in the competitive market.
- Market research also indicated there are numerous vendors available for this item. Three vendors pre-qualified to participate in the reverse auction.
- Although three vendors pre-qualified to participate in the reverse auction, only two bidders participated in the actual reverse auction. The non-participatory bidder stated the entry price was already too low. This entry price, or reserve price, is the reverse auction starting price that was set by the Government and stated in the solicitation.
- Global competition was achieved since one bidder was based in the Netherlands.

Investigative Question 2

The second central idea explored is the criteria used to award the contract.

- The Federal Acquisition Regulation (FAR) defines best value as the expected outcome of an acquisition that provides the greatest overall benefit to the requirement. This reverse auction is a best value, price performance trade-off that allows for the evaluation of criteria other than cost. Vendors submitted a pre-qualification package that evaluates factors other than cost such as past performance. This process allows the contract to be awarded to the vendor providing the best value to the government.
- Vendors were informed in the solicitation directions that pre-qualification was mandatory. The pre-qualified vendors were then issued a user identification code and password for entry into the reverse auction software mechanism.
- Vendors were evaluated on past performance and required to show they had produced the item within the past three years.
- One pre-qualified vendor did not participate actively in the reverse auction because the starting price was already too low. Again, the Government set this reverse auction starting price, reserve price.
- Award was made to the low, pre-qualified bidder.
- Award was made as a result of this reverse auction.

Investigative Question 3

The final central idea explored is the limitations encountered during the reverse auction process.

- In order to conduct this reverse auction, some engineering concessions were made. Under normal procurement procedures for this item, a first article is requested under one Contract Line Item Number (CLIN). Another CLIN contains the production quantity requirement, which is priced separately from the first article. The reverse auction service provider could not accommodate two CLINs. Therefore, the first article requirement was deleted to accommodate one CLIN and replaced with stringent pre-qualification requirements such as vendors were required to have produced the item within the past three years. Additionally, a waiver was processed to allow the deletion of the first article requirement.
- The reverse auction pre-qualification process allows the government to restrict those vendors qualified to participate. Vendors were informed in the solicitation directions that a pre-qualification was mandatory. After pre-qualification, vendors were issued a user identification code and password for entry into the reverse auction software mechanism.
- In this case the reverse auction service provider trained both government and vendor pre-qualified bidders. Additionally, the reverse auction service provider dealt with other issues such as problems with the reverse auction software and connectivity issues.
- Two government only reverse auction training sessions were conducted prior to the real reverse auction. The reverse auction service provider trained the pre-qualified vendors on the reverse

auction procedures (one-on-one). Following this training period, a mock reverse auction was held with all of the participating vendors and government personnel.

- The government team members participating in the mock auction experienced several problems:
 1. One vendor was unable to bid. The cause was not determined even after contacting the reverse auction service provider.
 2. One vendor attempted to access the auction during an extended period. The vendor was informed that the auction had closed when it still had four minutes remaining.
 3. Computer connectivity problems were experienced. There was a base wide server failure five minutes prior to starting the reverse auction. The vendors were still able to conduct the reverse auction without the buyer being able to access the site and get the results.

The reverse auction service provider, prior to the actual auction dates, was not able to address the concerns of the mock auction. The government team members participating in the mock auctions recommended numerous software changes to the reverse auction service provider. Recommendations were forwarded to HQ AFMC/PKL and SAF/AQC who in turn forwarded the recommendations to the reverse auction service provider. The service provider, prior to the actual auction dates, could not incorporate the recommendations that were requested during the mock auctions.

- Government personnel depict the reverse auction process as time consuming because they must actively take part in the reverse auction, which could take several hours of dedicated participation.
- Three bidders qualified but only two participated in the reverse auction. The non-participatory bidder stated that the entry price was too low and therefore they would not be able to bid.
- One vendor issued a letter of concern stating the Government was restricting competition by not allowing them to compete. Although engineers approved their pre-qualification package they were unable to meet the additional stringent past performance requirements stated in the solicitation, which required the vendor to have produced the item within the past three years. If a first article requirement had been allowed, the vendor would have been able to participate in the complete acquisition process.
- If numerous vendors are participating in the reverse auction and a problem arises a call may need placed to each vendor immediately. Therefore, the reverse auction process may require additional personnel to complete this task.

Case B – Overview

This reverse auction was conducted to procure 54 link assemblies for the B-1B. The total estimated cost based on historical buys was \$207,900.00. The award was made to the pre-qualified bidder with the lowest bid of \$141,750.00, an estimated savings of 32%. Case B was from the same procuring office as Case A. There was only a short

period between the two auctions and did not allow enough time for “lessons learned” from the first reverse auction to be incorporated into the second reverse auction.

Case B – Mind Map

A mind map for the research question responses and acquisition documentation is shown at Appendix D.

Investigative Question 1

The first central idea explored is the nature of the DOD competitive market.

- Market research was conducted prior to selecting the reverse auction technique. Market research indicates that this item is a commercial item available in the competitive market.
- Market research indicates that there are numerous vendors available for this item. Three vendors pre- qualified to participate in the reverse auction.
- Although three vendors pre-qualified to participate in the reverse auction, only two bidders participated in the actual auction. Again, the non-participatory bidder stated that the entry price was already too low.

Investigative Question 2

The second central idea explored is the criteria used to award the contract.

- This reverse auction is a best value, price performance trade-off that allows for the evaluation of criteria other than cost. Vendors were required to submit the following:
 - a. Contract Number;

- b. Name and address of procuring contracting officer and buyer;
- c. Name and address of cognizant administrative contracting officer;
- d. Number of modifications extending delivery date and reason delivery date was extended, e.g., change in government requirements, etc.;
- e. Statement regarding any problems encountered in performing the contact.

This information, together with information received from other sources, allowed the government to access present and past performance so a performance risk rating could be assigned to each offeror's proposal. This process allows the contract to be awarded to the vendor that provides the best value to the government.

- Vendors were informed in the solicitation directions that pre-qualification was mandatory. The pre-qualified vendors were then issued a user identification code and password for entry into the reverse auction software mechanism.
- Award was made to the low, pre-qualified bidder.
- One vendor submitted a local protest stating they submitted a bid prior to closing but it was not accepted due to computer sluggishness.

Therefore, the reverse auction results were not used. Instead, the solicitation allowed the government to request a final proposal revision and, therefore, vendors submitted their final bid via mail. In the end, award was made to the low, pre-qualified bidder using the final proposal revision.

Investigative Question 3

The final central idea explored is the limitations encountered during the reverse auction process.

- In order to conduct a reverse auction, some engineering concessions were made. Again, the reverse auction service provider is unable to accommodate a reverse auction with multiple CLINs. Under normal procurement procedures for this item, a first article is requested under one CLIN prior to the production quantity, which is priced separately under another CLIN. Therefore, the first article requirement was deleted to accommodate one CLIN and replaced with stringent pre-qualification requirements. The requiring engineers agreed to waive the first article requirement under specific conditions. First, the vendors had to submit pre-qualification packages for engineering evaluation purposes. Second, if the engineers accepted the pre-qualification package and could ascertain recent production quality, then the vendors would be allowed to participate in that particular acquisition. Lastly, with the waiving of the first article requirement, the contractor was required to comply with the International Organization of Standardizations (ISO), which promote the development of international standards and facilitate the exchange of goods and services worldwide. ISO 9002 was incorporated into the contract and is applicable to companies that produce and distribute their products or services (ISO Easy, 2002).

- The reverse auction pre-qualification process allows the government to restrict those vendors qualified to participate. Vendors were informed in the solicitation directions that a pre-qualification was mandatory.
- In this case the reverse auction service provider trained both government and pre-qualified bidders.
- Two government only reverse auction training sessions were conducted prior to the reverse auctions. Software concerns and recommendations were provided to the reverse auction service provider. The service provider gave pre-qualified vendors training (one-on-one) of system usage. Following this training period, a mock reverse auction was held with all of the participating vendors and the buyer.
- This reverse auction could not sustain a protest. The Procuring Contracting Officer (PCO) received a local protest. The protest complained that lag time between each bid, due to computer sluggishness, was unacceptable because they were not able to submit their final bid. The continual need to “refresh” the screen, to ensure the latest bid was visible, took substantially longer than “real time”. Following are the issues identified by the participating reverse auction vendor:

1. The auction site from Frictionless, the reverse auction service provider, did not function as represented within the demonstration/trial auction. During the trial auction the “Refresh

Bid History” brought up an automatically updated window (that refreshed every 5 seconds). This did not happen during the live auction, making the bidder manually refresh the screen, which took from 10 seconds to over 3 minutes.

2. The speed of the auction site was sluggish. The vendor states they have a T-internet connection to allow extremely fast connection to the Internet. The processing/reply time from this reverse auction site was comparable to a Dial-up connection. The vendor claims the reverse auction service provider does not have sufficient throughput being delivered from the auction provider. This is not tolerable when dealing with live real-time transactions.

3. The total cycle time from making a bid to being able to return back to the auction page for the item was never less than 2 minutes.

4. The reverse auction clock counted down to zero and notified the vendor the auction closed and they appeared to hold the lowest bid. However, another bidder put in another bid (which was not posted or visible until screen was updated again). The vendor was unable to respond to another vendor’s lower bid. This is because the time is not actually live, but gets its update from the screen refresh and then begins to count down.

The concerns were looked into and the following conclusions were made by the PCO:

1. Vendor claims that the auction did not operate as it did during the mock reverse auction. The reverse auction service provider (Frictionless) stated that the screen did not change materially in functionality or appearance from the demonstration auction; however, the software provider did not dispute the vendor's claim that the duration for refresh took 10 second to over 3 minutes. Because no government personnel were present during the demonstration this claim could not be verified.
2. The reverse auction service provider admits (in writing) that the site was performing slower than usual once the auction started. The PCO was under the impression the reverse auction was supposed to be live real-time, which did not happen.
3. The reverse auction service provider admits of inconsistencies in the way that different browsers handle the refresh operation and stated they have made modifications to the application to eliminate the possibility of this happening again, regardless of the browser. It was concluded that this was a problem during the auction and now the reverse auction service provider has taken action to correct it. Therefore, the PCO determined that the reverse auction results would not be used and a request for final proposal revisions was obtained via paper methods.
 - The actual cost savings that may appear to be the result of a reverse auction may not be the case. The full acquisition cycle needs to be evaluated to include reverse auction training that requires personnel resources, cost of processing waivers, and the cost of protests received.

Case C - Overview

This reverse auction procurement was for a seventy-piece tool kit. The toolkits include simple hand tools, with two other special tools, a soldering iron with variable temperature control and wire strippers. These sustainment tools are used for shop and aircraft maintenance. The solicitation was posted on the Electronic Posting System (EPS) utilizing a combination Synopsis/Solicitation method allowed by the FAR. Four vendors submitted the required data.

Case C – Mind Map

A mind map for the research question responses and acquisition documentation is shown in Appendix E.

Investigative Question 1

The first central idea explored is the nature of the DOD competitive market.

- Market research indicates that there are numerous vendors available for this item. A solicitation notice was posted on 20 November 2000 with responses and requirement information due by 1 December 2000. Five vendors submitted data submissions for qualification to participate in the reverse auction. The reverse auction was held on 6 December 2000 with award made on 12 January 2001.
- Although five vendors submitted data submissions, only one bidder participated in the reverse auction. The reason for this was contributed (by the buyer) to the short delivery requirement, which was not identified during market research.

- To be technically acceptable, the items offered had to be acceptable for the governments intended use as stated in the solicitation acceptance criteria.
- The reverse auction requirement description was not adequate. Therefore, the solicitation was amended to add salient characteristics retrieved from the Fed Log. This was accomplished for each of the seventy tools, adding the acceptable brand names and part numbers.

Investigative Question 2

The second central idea explored is the criteria used to award the contract.

- Vendors were informed in the solicitation directions that a pre-qualification was mandatory. The pre-qualification required vendors to meet technical and past performance criteria.
- Past performance criteria requires the vendors to submit references and list related work performed. This allowed the government to discriminate against vendors and award to someone other than the low bidder.
- Award was made to the low, pre-qualified bidder.
- Award was made as a result of this reverse auction.

Investigative Question 3

The final central idea explored is the limitations encountered during the reverse auction process.

- There was no guidance or established policies available. This opportunity allowed the procuring personnel to simplify the process

from its creation. Appendix G shows the special reverse auction instructions and agreements that were developed and incorporated into the solicitation and follow-on contract.

- The solicitation delivery time requirement was 14 days after receipt of the award. Although this was clearly stated in the solicitation only one contractor made their concern known, about the short delivery, prior to the reverse auction. Because the end user desperately needed these tool kits, the reverse auction was conducted with hopes that at least one contractor would participate in the reverse auction.
- In this case the reverse auction service provider trained both government and vendor pre-qualified bidders. The education process took about 10 minutes for each vendor and was conducted by the reverse auction service provider. Many revisions were made prior to the actual action starting, and vendors were continually updated to assure they were thoroughly educated prior to the reverse auction start time.
- Five bidders qualified but only one participated in the reverse auction. The starting price was too low for the small businesses to make profit on the contract.
- The actual cost savings that may appear to be the result of a reverse auction may not be the case. The full acquisition cycle needs to be evaluated to include reverse auction training that requires personnel

resources, cost of processing waivers, and the cost of the service provider.

The second part of this chapter conducts a comparative analysis and identifies similar factors between each case.

Pattern-Matching

Table 4 provides a list of factors identified in this research and correlates the factors to the research areas as follows:

Investigative Area 1: What is the nature of the DOD competitive market when using reverse auctioning?

Investigative Area 2: Can the Air Force use reverse auctions for other than low price, information technology?

Investigative Area 3: What are the primary limitations of the reverse auction process?

	Research Area	Case A	Case B	Case C
Commercially Available	1	X	X	X
Global Competition Received	1		X	
Numerous Vendors	1	X	X	X
Received Competition	1	X	X	
Firm Fixed Price	1	X	X	X
Full Service Software Provider	1,3	X	X	X
Pre-qualification Required	1	X	X	X
Market Research Conducted	1	X	X	X
RA Award	2	X		X
Low Bid	2	X	X	X
Higher Level Inspection	2	X	X	
Past Performance	2	X	X	X
Pre-qualification	2,3	X	X	X
Best Value (PPT)	2	X	X	
Technical Criteria	2	X	X	X
100% SB Set-aside	2		X	X
Protested	2,3		X	
Time Consuming	3	X	X	X
No Control over Connectivity	3	X	X	
Training - Government	3	X	X	X
Training - Vendors	3	X	X	X

Table 4: Pattern Matching

Comparative Analysis

- Each case studied was for the procurement of a commercial item. This indicates reverse auctioning should be used to buy items readily available in the marketplace and supports the theory that reverse auctions should be used for commercial items.
- Global competition was received in one of the three cases. This supports the theory that e-commerce is working to reach a larger, global supplier database.
- Numerous vendors indicated interest in participating in each of the three cases studied.
- Competition was received in only two of the three cases. This indicates that preliminary market research should be more complete. Expected delivery terms,

and any unique requirements should be exposed prior to solicitation issuance.

Additionally, the Government should not set the opening bid price and allow the market to drive the price.

- All three cases were awarded on a firm fixed pricing arrangement.
- All three cases used a full-service reverse auction provider. Each provider had software and hardware problems.
- In each case the vendor had pre-qualification terms that had to be met prior to the reverse auction. This supports the theory that reverse auctions can be used to procure items that include award criteria other than low price alone.
- Award was made using the results of the reverse auction in only two of the three cases studied.
- In each case award was made to the low, pre-qualified bidder.
- Past performance standards were required in each case.

Conclusions of Cross-Case Analysis

Two areas were identified as critical to the reverse auction process. First, organizations should assure the reverse auction service provider can support the reverse auction process. Second, complete market research must be accomplished to provide accurate information.

It is critical that the proper reverse auction service provider is selected. Problems experienced in each case study were a direct result of the reverse auction service provider. In Case B the reverse auction results were not used due to the problems experienced as a direct result of the reverse auction service provider. In general, reverse auction service providers were unable to conduct the reverse auctions in real time without

delays and were unable to accommodate multiple bidding formats. Most agencies do not have the technical expertise to conduct their own auction and rely on a full service reverse auction enabler. To avoid problems with reverse auction provider's, organizations should consider the track record of the enabler; the technology used and its flexibility and their contingency plan for technical or other difficulties.

A complete investigation of the market should be made during the market research phase. Vendors must be notified of unique requirements and short delivery schedules. If they do not know the conditions of the buy-in they may not be willing to participate in the end. Additionally, the Government should not set a "reserve" price and allow the market to drive the price downward by the participating vendors.

To increase the external validity of this research, a fourth case was studied and the findings were compared to the cross-case analysis of the first three cases.

	Research Area	Case A	Case B	Case C	Case D
Commercially Available	1	X	X	X	X
Numerous Vendors	1	X	X	X	X
Firm Fixed Price	1	X	X	X	X
Full Service Software Provider	1,3	X	X	X	X
Pre-qualification Required	1,2,3	X	X	X	X
Market Research Conducted	1	X	X	X	X
Low Bid	2	X	X	X	X
Past Performance	2	X	X	X	X
Technical Criteria	2	X	X	X	X
Time Consuming	3	X	X	X	X
Training - Government	3	X	X	X	X
Training - Vendors	3	X	X	X	X

Table 5: Comparative Pattern Matching

Case D – Overview

This reverse auction was conducted to procure environmental control systems test sets for the F-15 aircraft. CLIN 0001AA was for two first articles test units and CLIN

0001AB was for the follow-on production units. Due to funding uncertainties, vendors proposed production quantities in three increments. Increment A was for the quantity 34-44. Increment B was for the quantity 45-55. Increment C was for the quantity of 56-68. The second CLIN was for data and CLIN 0003 was an option to procure four circuit card assemblies. This item had never been produced in quantity so a historical price was not available. The government reported savings of 50% over their market research estimate.

Case D – Analysis and Findings

A mind map for the research question responses and acquisition documentation is shown in Appendix F. The cross case analysis findings are compared to the findings of this Case D.

The first central idea explored is the nature of the DOD competitive market.

- Cases A-C found that reverse auctions should be conducted for procurement of commercial items available in the competitive market. Case D supports this finding, as this reverse auction was also for commercial items available in the competitive market.
- In cases A-C, more competition was anticipated than received. Case D supports this as market research indicated 11 vendors were planning on taking part in the reverse auction. However, only four vendors submitted bids during the reverse auction.
- Case D supports the theory provided by cases A-C, reverse auctions can be conducted to procure firm fixed price contracts.
- All four cases used a full-service provider. However, each reverse auction service provider encountered software and hardware problems.

- In each case the vendor had pre-qualification terms that had to be met prior to the reverse auction. This indicates that reverse auctions can be used to procure items and include award criteria other than price alone.

The second central idea explored is the criteria used to award the contract.

- In each case, pre-qualifications were required prior to the reverse auction, which allowed the government to restrict vendors based on technical criteria, and past performance.
- Market research revealed there are at least two small businesses that will participate. Therefore, this procurement was 100% set-aside for a small business award.
- In this Case D, the procurement required a first article prior to producing the production amount. The reverse auction service provider could handle multiple contract line item numbers to allow for both a first article and production. The reverse auction service provider could not do this in Cases A & B.
- In all cases, award was made to the low, pre-qualified bidder.
- Award was made as a result of this reverse auction.

The final central idea explored is limitations encountered during the reverse auction process.

- The reverse auction service provider plays many critical roles in the reverse auction process. In this case the service provider trained both government and vendor pre-qualified bidders. Additionally, the

service provider deals with other issues such as problems with the reverse auction software and connectivity issues.

- Training was first given to government acquisition personnel followed by training for those vendors that qualified technically.
- The reverse auction process cannot sustain a protest. Several offerors complained they had problem timing out when placing bids. This was the result of the clock freezing on the screen when they entered the area to type in the bid. Two offerors complained during the auction and, therefore, the auction was reset and continued until finished.
- The solicitation required development of two special clauses, Instruction, Conditions and Notices to offerors and the other entitled Basis for Contract Award.
- There is limited participation from vendors that do not want to participate in a reverse auction. Therefore, maximum competition may not be received.

Conclusions of Case D Cross Case Analysis

It is critical that the proper reverse auction service provider is selected. Problems experienced in each case study were a direct result of the reverse auction service provider. In one case the reverse auction results were not used due to the problems experienced as a result of the reverse auction software. Reverse auction service providers were unable to conduct the auction in real time without delays and were unable to accommodate multiple bidding formats. This supports the theory that when selecting a reverse auction provider, organizations should consider the track record of the enabler;

the technology used and its flexibility and a contingency plan for technical or other difficulties.

Vendors must be notified of unique requirements such as short delivery schedules. In order to maximize competition, the Government should stop setting a reverse auction reserve price and let the market drive the price.

V. CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to draw conclusions based on the analysis conducted in Chapter IV. Each investigative area question is answered, followed by conclusions and recommendations. Then, the limitations of the research are presented together with potential topics for future research.

Investigative Area 1: What is the nature of the Department Of Defense competitive market when using reverse auctioning?

In each case, market research analysis was conducted to study practices in the particular market segment. All four case studies provide a clearly defined requirement, available from at least two competent vendors in the commercial, competitive marketplace. This factor leads to the question of why did vendors say they would participate in the reverse auction process but then did not?

In each case, the government anticipates more competition than received. In one of the four reverse auctions only one vendor participated. During the market research phase the buying activity received “buy-in” from the vendors but did not identify all critical information for making an informed decision about whether to participate in the reverse auction or not such as:

- Short delivery period
- Starting bid price
- Pre-qualifications

The Air Force should continue analyzing the standard practices of the particular market segment before determining to use a reverse auction. During the market research phase, delivery requirements, pre-qualification requirements, and any other unique

criteria should be revealed. This will allow vendors to assess their competitiveness before committing a lot of time and effort. Eliminating the “reserve” price set by the Government will allow the vendors to start the reverse auction price and drive it downward, maximizing competition.

Investigative Area 2: Can we use reverse auctions for other than low price, Information Technology (IT)?

In each case the Air Force was able to consider criteria other than low price. Each case effectively stated criteria such as past performance and technical requirements that enabled the Air Force to limit the participation in the reverse auction to vendors that met the pre-qualification requirements.

It is recommended that the Air Force continue using reverse auctioning for procurements that have award criteria other than low price. However, assurances must be made that pre-qualifications are not too restrictive, thereby eliminating competition and creating a potential protest.

The conclusion of this research is that reverse auctioning can be used to award contracts with award criteria other than low price. The Air Force successfully awarded contracts from Case A, Case C, and Case D. Case B was not awarded from the reverse auction results but its failure was not due to the award criteria.

Investigative Area 3: What are the primary limitations of the reverse auction process?

There are numerous limitations in the reverse auction process as identified in each case study. Two primary limitations found in each case include the effectiveness of the reverse auction service provider and the “reserve” starting price for the reverse auction.

Organizations must consider the following when selecting a reverse auction provider:

- a. The track record of the enabler, which should include number of current and past clients; volume of business; and customer satisfaction to include past performance to determine if they can provide what they say they can;
- b. The technology used, its flexibility, and;
- c. Reverse auction service provider’s contingency plan for technical or other difficulties.

Vendors must be notified of unique requirements prior to receiving their buy-in. During market research, organizations should identify any unique requirements involved such as quick delivery. Also, organizations need to let the market drive the price of the reverse auction and eliminate the starting price of the auction set by the Government.

Lessons Learned

In one case, the first article test requirement was deleted and replaced with compliance to International Organization of Standardization, ISO 9002, which promotes the development of international standards to facilitate the exchange of goods and services worldwide. This is a good step toward true utilization of commercial procedures versus unique military specifications and first article requirements.

In one case, the solicitation was set up to anticipate problems with the reverse auction process. Therefore, award could be made from the reverse auction process or the second alternative was to discard the reverse auction results and request vendor's final proposal revisions via mail.

Final Recommendation

It is recommended that the Air Force ensure that the reverse auction service provider can provide adequate service to successfully conduct the auction. This should allow the Air Force to use the reverse auctioning process without fear of receiving a protest from vendors due to faulty software. To accomplish this may require a source selection for a single USAF service provider, which will allow the Air Force to select one vendor that can provide the most efficient and effective reverse auction services.

Additionally, it is recommended that the Air Force should eliminate the use of a starting reverse auction price. In each case, this "reserve" price was set by the Government and limited participation. Deletion of this starting bid price should maximize participation and will allow the market to drive the price.

Vendors were evaluated on past performance and required to show they had produced the item within the past three years. The Government must have a valid reason to restrict this procurement to vendors that have produced the item within the past three years. If there is no specific reason for this requirement, it is protestable. This is evidenced by a letter of concern from one pre-qualified vendor that did not meet the additional stringent past performance requirement. The letter of concern states the Government was restricting competition by not allowing them to compete. With the use

of commercial practices such as ISO standards, the vendor would have been able to participate in the complete acquisition process.

Research Limitations

The Air Force has only used reverse auctioning to conduct four procurements for other than Information Technology (IT). This small number of reverse auctions limits the researchers ability to match patterns of more reverse auctions.

IT reverse auctions were not studied in this research effort. Therefore, the findings from to IT reverse auctions could not be compared to the findings of this research.

The characterization of a “successful” reverse auction was not defined. The definition can vary depending on the perceptions of the vendors and the Government.

Recommendations for Future Research

The Air Force should study the reported reverse auction savings and determine if all costs were considered. The additional costs that need to be measured are the manpower resources utilized in receiving reverse auction training; the cost of the reverse auction provider, and the cost of limited participants.

The Air Force should examine existing reverse auction service providers to determine if software should be developed for Government usage. Currently, each government office is responsible for obtaining the reverse auction service provider. This is risky as was experienced in each case of this research. Some providers claim to have a successful reverse auction system in place but fail to perform adequately during the actual action when all players are involved. A source selection to select a single enabler

would provide the Air Force with a tool to use by each office and should eliminate the need for continual reverse auctioning training.

Study Air Force Information Technology reverse auctions and compare the results of these auctions to the results of this research.

Reverse auctions may damage buyer-supplier relationships with the Government. It is recommended that additional research be conducted to find out if the participating vendors felt exploited by the reverse auction process and study how the reverse auctions affect the DOD industrial supplier base.

Study the definition of a “successful” reverse auction from the Government and vendor’s perspective.

Appendix A: Initial Contact with Primary Point Of Contacts

-----Original Message-----

From: Marion Cynthia L CIV AFIT/ENV [<mailto:Cynthia.Marion@afit.edu>]
Sent: Tuesday, August 07, 2001 10:26 AM
To: WRALC/PKOCA; OO-ALC/PKPQ; WRALC/LFKA
Subject: Reverse Auctions - Request for Thesis Data

TO: Buyer, Wright-Patterson AFB OH (58390)
Buyer, Robin AFB GA (DSN 468-9287)
Buyer, Robins AFB GA (DSN 486-2477)
Buyer, Hill AFB UT (DSN 777-7807)

My name is Cindy Marion and I am a student at the Air Force Institute of Technology, Graduate School of Engineering and Management, AFIT/ENV, Wright-Patterson AFB OH. My e-mail address is: Cynthia.Marion@afit.edu. I am working on my thesis entitled Reverse Auctioning. My sponsor is AFMC/PKO, Lt Col (S) Steve Elliott. He provided your name as a possible point of contact to assist me in my thesis research.

Will you be able and willing to assist me in providing data? Specifically, answering some general questions about the Reverse Auctioning process that you accomplished and going through the contract file and providing documents such as the market research, RFP, contract, possible protests, and any unique information/documents that was related to your reverse auction, etc.

Please let me know as soon as possible if you can help via response to this e-mail. Additionally, if you can help, please provide the aforementioned materials either via e-mail or send to:

AFIT/ENV
Graduate School of Engineering & Management
ATTN: Cindy Marion, Student
Wright-Patterson AFB OH 45433

My timeline: I will contact you for a short interview via telephone or you may complete the questions (I am still developing) and e-mail your response back to me. I expect to contact you and complete the questions around the end of September or toward to beginning of October. I can provide the questions earlier if this would be more convenient.

Thank you for your time!

Again, please let me know if I can count on you to provide data for my thesis.

Cindy Marion, AFIT/ENV
Wright-Patterson AFB OH

Appendix B: Investigative Questions

Investigative Area 1

What is the nature of the DOD competitive market when using reverse auctioning? The intent of this question is to identify the characteristics of a competitive market and determine what type of buyer-supplier relationship exists.

1. How is the nature of the DOD competitive market affected by reverse auctioning?
2. How does reverse auctioning affect the type of supplier relationship that is involved with the item being procured and what type of relationship is needed?
3. How does reverse auctioning affect the DOD industrial base?
4. How did you determine if your reverse auction was to be restricted and did you have any problems?

Investigative Area 2

Can we use reverse auctions for other than low price, information technology? The intent of this question is to determine what factors, other than low price, can be considered for award criteria of a reverse auction.

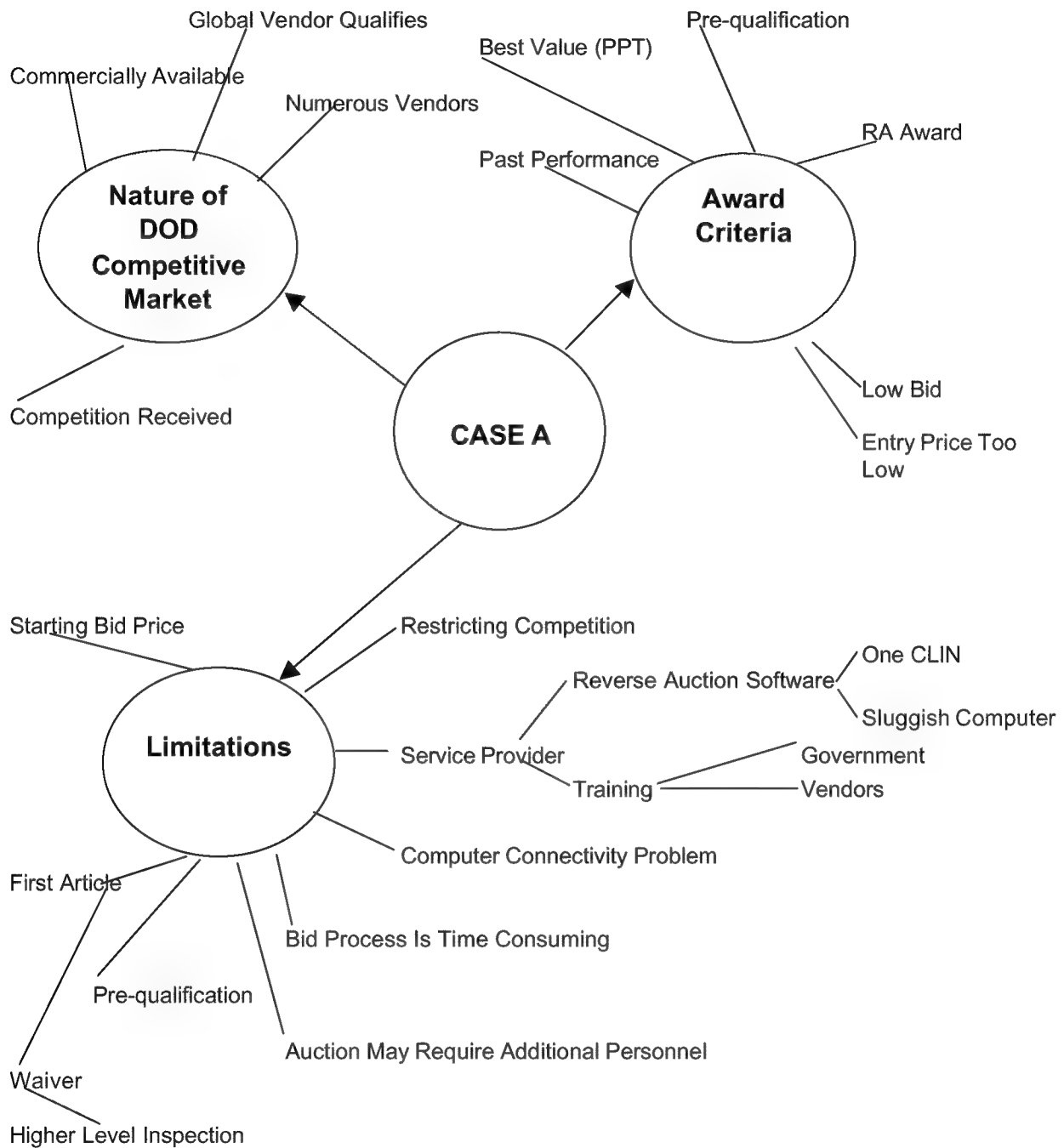
5. What are the award criteria and why was it selected?

Investigative Area 3

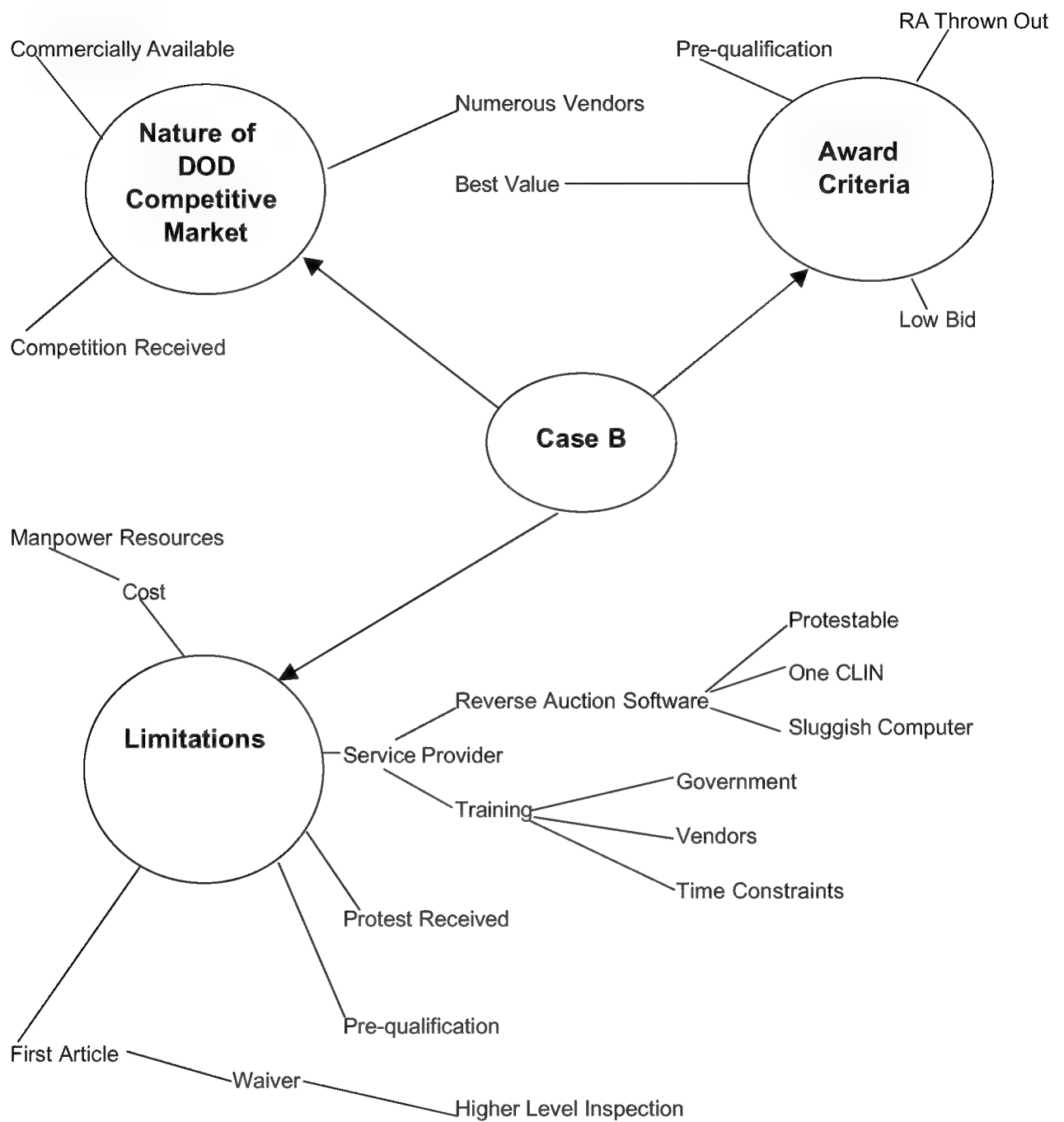
What are the primary limitations of the reverse auction process? The intent of this question is to identify factors that limit the usefulness of a reverse auction.

6. Did you develop any special contract clauses for your reverse auction, and, if so, what were they?
7. How was the selection of the reverse auction service provider made?
8. What were the primary limitations of the reverse auction process?

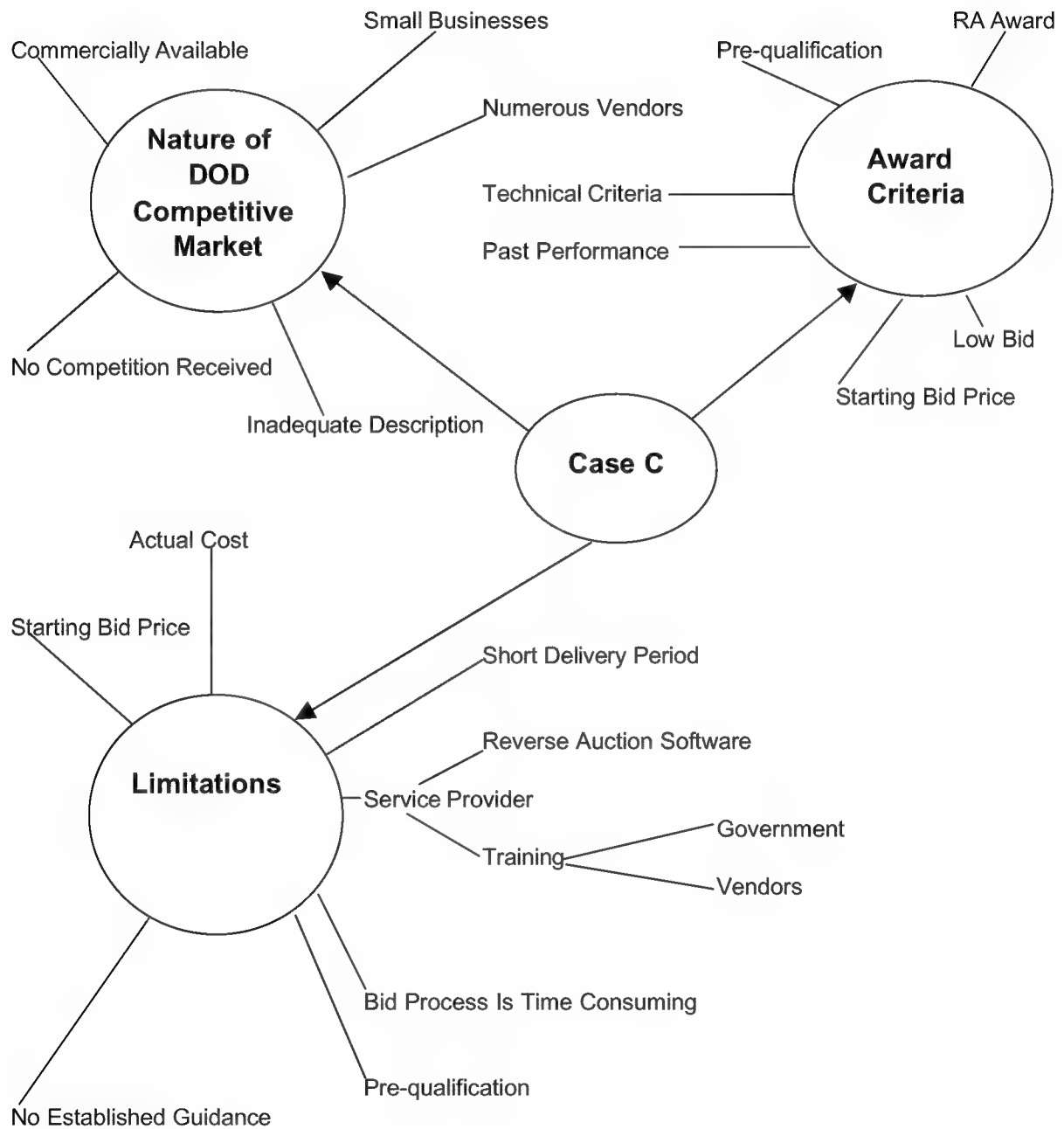
Appendix C: Case A Open Coded Mind Map



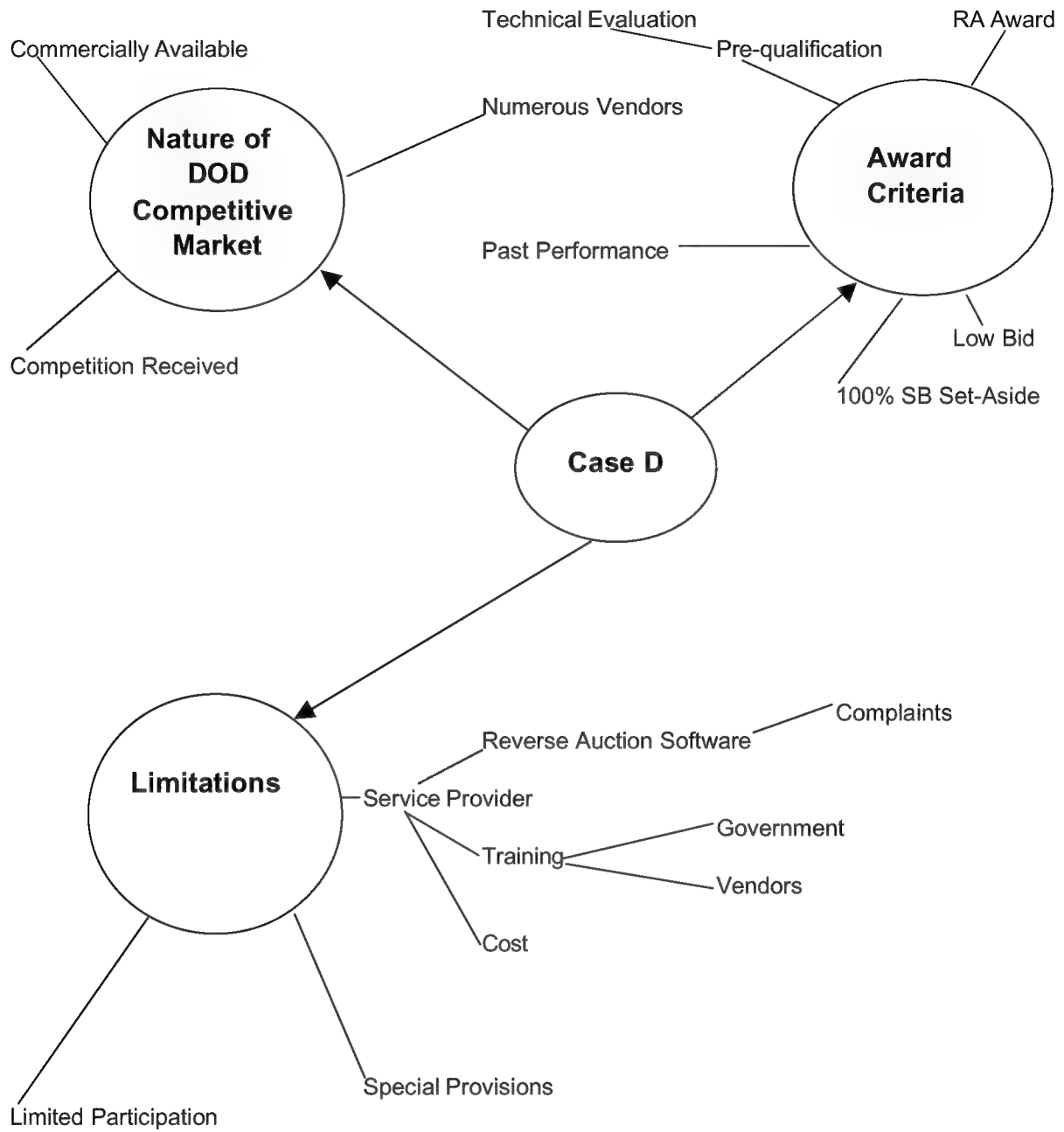
Appendix D: Case B Open Coded Mind Map



Appendix E: Case C Open Coded Mind Map



Appendix F: Case D Open Coded Mind Map



Appendix G: Reverse Auction Instructions and Agreement

1. WR-ALC at Robins AFB will conduct a competitive, anonymous, on-line reverse auction for. WR-ALC has teamed with the US Army Communications and Electronics Command (CECOM) to conduct the reverse auction for this requirement. The URL for the reverse auction is <http://abop.monmouth.army.mil>. Interested parties shall contact the Contracting Office at Robins AFB to receive a username and password for the reverse auction.

2. If a participant would like a demonstration of the reverse auctioning tool, contact this office at least one week prior to commencement of the auction. All signed documents required by this action shall be sent to this office by fax or by email. (Electronically signed documents shall be readable in MS Word or Adobe PDF format.)

3. Proposal submission. This acquisition will be made by reverse auction procedures. Only sources whose offers are determined to be technically acceptable may participate in the reverse auction. Participants will use the reverse auctioning tool developed by CECOM currently in a pilot phase. This is a competitive, anonymous, on-line auction in which participants will submit a series of bids that descend in price. By participating in this reverse auction you grant the government the right to disclose your prices, however your name will be kept anonymous.

Procedures for the auction:

4. At 1:30pm EST on 06Dec00 the auction shall commence and at 2:30pm EST the auction shall close unless an extension is given. The Army site server clock identifies the "Approx. Time of Close". The system will automatically extend the closing time should a bid be placed within the last five minutes of the auction. Further, if an extension period is generated and a quote is submitted at any time within the extension period, another five minutes extension period will be generated, otherwise the reverse auction will close. There will be no limits on the number of extensions in this reverse auction.

5. During the reverse auction, contractors may bid as often as they want, but shall bid only on the total quantity of 100 Kits. Prices entered on the web site shall be for unit prices only. Contractors are not required to revise their prices during the reverse auction. Contractor's quotes must differ from the market-leading quote by at least the decrement identified in the "Auction Details" at the Reverse Auction web site. Ensure you complete all required blanks on the web site prior to submitting a quote, and check the appropriate boxes. Contractors will submit revised pricing only through the online web site specified above during the reverse auction. Contracting Officer will not accept revised pricing via any other mechanism including but not limited to post, courier, fax, e-mail, or orally unless specifically requested by the contracting officer. Once the reverse auction is complete, all contractors shall submit a signed copy of their price quote to the point of contact above.

6. The Contracting Officer reserves the right to make no award under this procedure. The contracting officer also reserves the right to suspend or cancel the reverse auction at any time. If the contracting officer cancels the reverse auction, the order may be processed using normal procedures.

7. By participating in the reverse auction, contractors certify they will not knowingly disclosure their prices to any other quoter except anonymously during the on-line reverse auction. The Contractor further certifies that anonymous disclosure of its prices during the reverse auction shall not be for the purposes of restricting competition.

8. Contractors are required to sign the SF 1449 and return to this office prior to receiving a user ID and Logon password. By signing this document, contractors agree to abide by the terms of this reverse auction agreement.

9. Provide the name of the individual who will represent your company during the reverse auction.

(insert name and phone number)

Bibliography

- Atkinson, William. IT Firm uses Reverse Auction for Big Contract Labor Buy, *Purchasing.com*, December 22, 2000.
- Buzan, Tony and Barry Buzan. *The Mind Map Book: How to Use Radiant Thinking to Maximize Your Brain's Untapped Potential*. New York: Penguin Books, 1993.
- Calderon, Sheryl, FORSCOM's First Reverse Auction Conducted at Fort Hood, Army Acquisition Reform Newsletter – Volume 6, 26 September 2000.
- Cavinato, Joseph L. "A Total Cost/Value Model for Supply Chain Competitiveness," *Journal of Business Logistics*, 13(2): 285-301 (1992)
- Clarkson, Tom. U.S. Army Communications-Electronics Command, Release No. 00-27, May 18, 2000.
- Dickey, Connie E., Secretary Cohen, Deputy Secretary Hamre publish Defense Reform Update 1999, Program Manager, May/Jun 99, Volume 28, Issue 3, p72, 3p.
- Dooley, David. *Social Research Methods (Third Edition)*. Upper Saddle River NJ: Prentice Hall, 1995.
- Elliott, Steve Maj., Presentation on Reverse Auctioning, National Contract Management Association, Hot Topics in Contracting and Acquisition Conference, 17 May 2001.
- Federal Acquisition Regulation. Current through Federal Acquisition Circular 97-36 (May, 2001).
- Galbraith, Mary. Internet contract auction saves money, *Hilltop Times*, January 25, 2000.
- Harris, Shane. Getting Ready for Reverse Auctions, *The Public Purchaser*, May/June 2001.
- Harris, Shane. Bidding Wars, *Government Executive*, May 2001.
- ISO Easy, Frequently Asked Questions and Answers, www.isoeasy.com, 2002.
- Kraljic, Peter, "Purchasing Must Become Supply Management," *Harvard Business Review*, 61(5): 109-117 (Sep/Oct 1983).
- Jap, Sandy. "Going, Going, Gone," *Harvard Business Review*, Nov/Dec 2000.

- Matthews, William. "Postal Service first to try online reverse auctions," *Federal Computer Week*, Apr 17, 2000.
- Merson, Ina R. A Contracting Officer's Guide to Reverse Auctions, *Acquisition Solutions, Inc. Advisory*, October 2000.
- Randolph Air Force Base, Air Force Personnel Center, Reverse Auctions Saves AFPC nearly \$1 million, Release No. 025, Jan. 31, 2001.
- Rafter, Michelle V. Reverse Auctions Catching On, www.thestandard.net, October 26, 1998.
- Ritchie, Ed. Up for Auction: Government Contracts, www.auctionwatch.com, September 13, 1999.
- Schmitt, N.W. and R.J. Klimoski. Understanding the Organization Through Qualitative Research," *Research Method in Human Resource Management*. Cincinnati OH: Southwestern Publishers, 1991.
- Seffers, George I. Military salutes online auctions, www.fcw.com, 05/15/2000.
- The Air Force Acquisition Reform Newsletter, Air Force "Aims High" with Reverse Auctioning Strategy, May/June 2001.
- Walsh, Trudy. Pennsylvania reaps millions in savings with reverse auctions, *Government Computer News*, July 2000.
- Washington Web Site, www.safaq.hq.af.mil/acq_ref/bolts99.html, 23 April 1999.
- Wyld, David C., After September 11th: Reverse Auctions in Government Procurement, *Contract Management*, February 2002.
- Yin, Robert K., *Case Study Research: Design and Methods, Second Edition*. Newbury Park CA: Sage Publications, 1994.

Vita

Mrs. Cynthia L. Marion-Mullins is a graduate of Bethel High School, New Carlisle, Ohio. She entered the work field in 1979 at the Defense Electronic Supply Center as a part-time employee. She received a full-time position at the Avionics Laboratory located at Wright-Patterson AFB where she has since held positions at the Materials Laboratory, R&D Contracting, the Aeronautical Equipment SPO, and Operational Base Contracting. She attended college at Edison State Community College, Sinclair Community College, Wright State University, and completed her Bachelor of Administration degree in Business Administration in 1992 from Central Michigan University.

Mrs. Marion-Mullins was admitted to the Graduate School of Engineering and Management, Air Force Institute of Technology (AFIT) as a full time student in September 2000. Upon completion of the AFIT Graduate Degree Program she will be assigned to a contracting position at Aeronautical Systems Center. She has been a member of the National Contract Management Association since 1993 and is a Certified Associate Contract Manager.

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<p>This research examines the pricing tool reverse auctioning. In a reverse auction buyer's state the item they wish to buy and the sellers compete with each other for the sale, driving the price steadily down until no seller is willing to go any lower. Darleen A. Druyun, Principal Deputy Assistant Secretary of the Air Force for Acquisition and Management, Washington, D.C., launched the Air Force acquisition reform "Lightning Bolts" initiatives. These initiatives jump-start acquisition reform to find processes leading towards a better, faster, and cheaper way of conducting business. A reverse auction is one of these processes. A review of the extant literature shows that reverse auctioning has been utilized in the commercial sector since 1994, covering thousands of types of items.</p> <p>Preliminary research explored the appropriateness of reverse auctioning in Information Technology. Recent studies indicate the use of reverse auctioning should be expanded beyond Information Technology. Air Force acquisition professionals have utilized reverse auctioning as the pricing technique for twenty procurements, nearly all for the procurement of low price Information Technology. This research will assist acquisition professionals in better understanding the challenges related to the use of the reverse auction beyond low price Information Technology.</p>						
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